

Conservation of Energy

6-5 The student will demonstrate an understanding of the law of conservation of energy and the properties of energy and work. (Physical Science)

6-5.8 Illustrate ways that simple machines exist in common tools and in complex machines.

Taxonomy level: 2.2-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have not been introduced to the concept of simple machines in previous grade levels.

It is essential for students to know how simple machines, such as levers, pulleys, inclined planes (ramps, wedges, screws) and wheel and axles are found in common tools and in complex (compound) machines. For example:

Levers

- Levers that have the fulcrum between where the effort force is applied and the weight is located can be found in tools, for example, scissors (two levers working together) and crowbar.
- Levers that have the fulcrum on the end and the effort is applied in the middle to lift a weight on the other end can be found in tools, for example, tweezers (two levers working together) or a broom.
- Levers that have the fulcrum on the end and the effort force are applied on the other end to lift a weight in the middle can be found in tools, for example, a wheelbarrow, or a bottle opener.

Pulleys

- Pulleys that are *fixed*, meaning that they are attached to a structure, can be found on the top of a flag pole and on window blinds.
- Pulleys that are *moveable*, meaning that they are not attached to a structure, can be found on construction cranes and as part of a block and tackle system.

Inclined planes

- Inclined planes with a sloping surface can be found as *ramps* on a truck or wheelchair ramp and stairs.
- Inclined planes that are *wedges*, one inclined plane or two back-to-back inclined planes that can move are found as knife blades or nails.
- Inclined planes that are wound around a post or cylinder are called *screws*. Screws can be found in bolts and jar lids.

Wheel and axles

- Wheel and axles consist of two circular objects: a central shaft, called an axle, inserted through the middle of a wheel.
- Wheel and axles can be found as door knobs, steering wheels, screwdrivers, gears, and bicycles wheels.

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Complex machines

Complex machines, also known as *compound machines*, consist of two or more simple machines. Examples may include:

- scissors consisting of two levers and two inclined planes (wedges);
- a fishing pole consisting of a lever, a wheel and axle and a pulley;
- a bicycle consists of levers (handlebars and handbrakes), wheel and axles (gears, wheels, and pedals), and a number of screws.

It is not essential for students to know which classes of levers are in common tools or complex machines.

Assessment Guidelines:

The objective of this indicator is to *illustrate* ways that simple machines exist in common tools and in complex machines; therefore the primary focus of assessment should be to simple machines that are part of simple tools and of complex machines using pictures, diagrams, or word descriptions. However, appropriate assessments should also require students to *identify* the types of simple machines that are found in common tools and in complex machines; *interpret* a diagram of common tools or complex machines to identify the simple machines present; *exemplify* common tools that are simple machines; or *exemplify* the use of simple machines in everyday life.